CLAIMS

WE CLAIM

1. An electrochemical cell comprising:

a container;

a cathode material disposed in the container, wherein the cathode presents an anode-facing surface;

an anode material disposed in the container adjacent the cathode; and

a separator disposed between the cathode and the anode, wherein the separator includes:

i. a perforated fabric presenting an anode-facing surface and a cathode-facing surface; and

ii. a conformal coating applied to at least one of the anode-facing surface, the cathode-facing surface, and the inner cathode surface, wherein the coating is formed from a polymeric material,

wherein the separator prohibits electrical contact between the anode and cathode while permitting electrolyte transfer between the anode and cathode.

2. The electrochemical cell as recited in claim 1, wherein the fabric is non-woven.

3. The electrochemical cell as recited in claim 2, wherein the fabric presents a plurality of apertures extending therethrough to expose an inner surface of the cathode, and wherein the conformal coating covers the inner surface.

4. The electrochemical cell as recited in claim 1, wherein the conformal coating further comprises a crosslinking agent.

5. The electrochemical cell as recited in claim 4, wherein the crosslinking agent is inorganic.

6. The electrochemical cell as recited in claim 5, wherein the crosslinking agent comprises a borate derivative.

7. The electrochemical cell as recited in claim 6, wherein the borate derivative is selected from the group consisting of potassium borate, sodium borate, zinc borate, and boric acid.

8. The electrochemical cell as recited in claim 7, wherein the borate derivative is boric acid.

9. The electrochemical cell as recited in claim 7, wherein the borate derivative is mixed with the polymer and electrolyte.

10. The electrochemical cell as recited in claim 1, wherein the polymer comprises a plurality of hydroxyl groups.

11. The electrochemical cell as recited in claim 10, wherein the polymer is a vinyl alcohol.

12. The electrochemical cell as recited in claim 11, wherein the polymer comprises polyvinyl alcohol.

13. The electrochemical cell as recited in claim 12, wherein the polyvinyl alcohol has an average molecular weight greater than 13,000 and less than 500,000.

14. The electrochemical cell as recited in claim 1, wherein the cell is selected from the group consisting of a cylindrical cell and a metal-air cell.

15. The electrochemical cell as recited in claim 1, wherein the polymer comprises a di-alcohol.

16. The electrochemical cell as recited in claim 1, wherein the polymer is selected from the group consisting of guar gum, guar gum derivatives, copolymers of polyvinyl alcohol, and polymeric materials with hydroxyl functional groups.

17. The electrochemical cell as recited in claim 4, wherein the polymer comprises polyvinyl alcohol and the crosslinking agent comprises a borate derivative, and wherein the weight ratio between the borate derivative and the vinyl alcohol is between 1:1000 and 1:1.

18. The electrochemical cell as recited in claim 4, wherein the crosslinking agent is a Lewis acid, and wherein the polymer is a Lewis base.

19. The electrochemical cell as recited in claim 3, wherein the fabric extends along a longitudinal direction, and wherein the apertures are offset with respect to the longitudinal direction.

20. The electrochemical cell as recited in claim 19, wherein the apertures are elongated and extend longitudinally within the cell.

21. The electrochemical cell as recited in claim 1, wherein the fabric is woven.

22. The electrochemical cell as recited in claim 1, wherein the cathode-facing surface of the fabric is coated with the conformal coating.

23. The electrochemical cell as recited in claim 1, wherein the anode-facing surface of the cathode is coated with the conformal coating.

24. The electrochemical cell as recited in claim 1, wherein the container has an open end, and wherein the fabric defines a portion disposed proximal the open end that is not perforated.

25. A method of preparing a conformal separator for an electrochemical cell defining an enclosure, the steps comprising:

(a) installing a cathode within the enclosure, the cathode presenting an inner surface;

(b) installing a perforated fabric into the enclosure adjacent the inner surface of the cathode, the fabric defining an anode-facing surface and a cathode-facing surface;

(c) crosslinking a polymer with an inorganic crosslinking agent to form a compound; and

(d) applying the compound to at least one of the anode-facing surface, the cathode-facing surface, and the inner cathode surface to provide a separator, wherein the compound prevents electrical contact between the anode and cathode while permitting electrolyte transfer between the anode and cathode.

26. The method as recited in claim 25, further comprising crosslinking the polymer and the agent prior to step (d).

27. The method as recited in claim 25, further comprising applying the polymer and agent individually to the anode-facing surface prior to step (c).

28. The method as recited in claim 25, wherein the fabric defines a plurality of apertures extending therethrough.

29. The method as recited in claim 28, further comprising applying the compound to the cathode at locations aligned with the apertures.

30. The method as recited in claim 25, wherein the crosslinking agent is a borate derivative, and wherein the polymer is a vinyl alcohol.

31. The method as recited in claim 30, wherein the borate derivative is boric acid, and wherein step (c) further comprising adding a base solution to the cathode.

32. The method as recited in claim 31, further comprising wetting the cathode with the base solution prior to step (d).

33. The method as recited in claim 31, further comprising wetting the cathode with the base solution after step (d).

34. The method as recited in claim 25, wherein the fabric is non-woven.

35. A method for reducing entrapped air during fabrication of an electrochemical cell, the steps comprising:

(a) providing a conductive cell container presenting a closed end and an open end, wherein the container presents a radially inner surface;

(b) installing a cathode material into the open end at a location adjacent the radially inner container surface, wherein the cathode presents a radially inner surface;

(c) installing a perforated fabric into the open end at a location adjacent the radially inner cathode surface, wherein the fabric includes a radially inner surface that defines an internal void; and

(d) applying an electrolyte material into the void, whereby the electrolyte migrates through the separator and into the cathode.

36. The method as recited in claim 35, further comprising applying a conformal separator coating to the radially inner fabric surface.

37. The method as recited in claim 36, further comprising applying the conformal separator coating cathode material that is exposed through the perforated fabric.

38. The method as recited in claim 37, wherein the coating comprises a polymeric material.

39. The method as recited in claim 38, wherein the polymeric material is combined with a crosslinking agent.